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ABSTRACT

Recent research on hypothesis testing strategies (the strategy a person uses to determine the correctness of a specific hypothesis) has produced contradictory results. The three strategies available have been labeled confirmatory, neutral, and disconfirmatory. Some research has found that a confirmatory testing style predominates, while other research has favored a neutral style. Hypothesis testing strategies were examined in the context of a cognitive mediational perspective. Subjects were 147 undergraduate students who completed two experiments and 23 counselors-in-training who completed the first experiment only. In experiment 1, all subjects were given descriptors of an extroverted or introverted person and then subjects were instructed to determine if a person they would soon meet matched those descriptors. Subjects were to choose 12 questions from a list of 26 that they would use to make their decisions. The first experiment ended with the question choosing. A computer was used to simulate the person (client) and to give responses. In the second experiment the computer became the questioner (counselor) and took a confirmatory, discomfirmatory, or neutral approach. The results showed that the neutral hypothesis testing strategy was preferred and was also rated as more trustworthy by undergraduates. A subject's choice of hypothesis testing strategy was found to be stable over time regardless of feedback from targets. (ABL)

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Counselor and Client Responses to Hypothesis Testing Strategies

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Running Head: HYPOTHESIS TESTING STRATEGIES

Abstract

Previous research examining the types of Hypothesis Testing Strategies (HTS) employed by counselors has produced contradictory findings, has not investigated HTSs in an interactive format, and has not investigated client reactions to different HTSs. For this study, 147 college undergraduates and 23 counselors-in-training interacted with a computer simulated client in Experiment I and counselor in Experiment II to investigate the above issues. The results indicate that of the three HTS's, confirmatory, disconfirmatory, and neutral, the neutral HTS is preferred and that a person's choice of HTS is stable across time and with different feedback. The neutral HTS was also seen by undergraduates as more trustworthy. Future research and implications for training counselors are discussed.

Counselor and Client Responses to Hypothesis Testing Strategies

The research of Snyder (1981) and Strohmer and Newman (1983) concerning Hypothesis Testing Strategies (HTS) has yielded contradictory results. Snyder (1981) has maintained that people use a confirmatory testing style while Strohmer and Newman (1983) claimed that a neutral style is predominant. These investigators recorded the HTS of subject's responses to static events or recorded the outcomes of a series of events without addressing the ongoing cognitive processing of subjects. Recently, Martin (1984) proposed that counseling researchers need to undergo a paradigm shift from a process-product approach which is similar to the work of Snyder (1981) and Strohmer & Newman (1983), to a cognitive mediational approach for research. In order to clarify the HTS contradiction mentioned above, this study re-examined this issue from within the cognitive mediational perspective.

In addition to Martin (1984), Fuqua, Johnson, Anderson, and Newman (1984) have indicated that until recently, little attention has been given to counselor cognitive processing of information or to client reactions to different processing styles. Perhaps this lack of attention is due to the difficulty within the cognitive mediational paradigm of collecting data on cognitions. Cognitive data are either collected after a sequence of events is over, before the sequence begins, or during the sequence but by overlaying both cognitive and behavioral actions on top of the events being researched (Martin, 1984). In addition, the three methods to collect data on cognitions outlined by Martin (1984) (process tracing, simulated recall, and cognitive training) all must contend with unpredictable clients and unpredictable client-counselor interactions. A major shift in methodology

that this study incorporated was to access cognitions immediately after each event by having subjects respond to a computer which also presented a predictable and stable client (and counselor). Hummel, Lichtenberg, and Shaffer (1975) have already demonstrated the feasibility of this methodology, yet it has not been incorporated into counseling process research.

Hypothesis Testing Strategies

A Hypothesis Testing Strategy (HTS) is the strategy that a person uses to determine the correctness of a specific hypothesis. The three strategies available have been labeled as confirmatory, neutral (or "scientific"), and disconfirmatory (Mahoney, 1976; Pepinsky & Pepinsky, 1954; Popper, 1959).

Mahoney (1976) has suggested that scientists generally follow the confirmatory HTS and Kuhn (1962) has outlined how this confirmatory approach is used to expand the boundaries of the current paradigm in a field. The results of this confirmatory approach has been labeled "natural science" (Kuhn, 1962; Mahoney, 1976). Researchers have found that both counselors and people in general overwhelmingly use the confirmatory HTS (Nisbett & Ross, 1980; Snyder, 1981; Tversky, 1977; Wason & Johnson-Laird, 1972). In counseling, the counselor employing this approach would form a hypothesis about a client (e.g., s/he is introverted) and then ask questions or make comments and gestures in support of that hypothesis. Unfortunately, this approach may evoke the confirmationist's dilemma of confirming an originally false assumption (Salmon, 1975).

The neutral HTS is the "scientific method" approach through which fact after fact is gathered in an unbiased way, thereby gradually accumulating information upon which to make decisions. This scientific approach is the prescriptive counseling approach of Pepinsky and Pepinsky (1954)

where at each question an unbiased approach is taken towards the client (e.g., in determining extroversion or introversion one would ask questions that seek both introverted and extroverted behaviors). Strohmer and Newman (1983) found in their research that counselors use this neutral approach.

Sir Francis Bacon was one of the first to espouse the disconfirmatory method of research and Popper introduced it in the literature under the title of falsificationism (Cook & Campbell, 1979; Platt, 1964). The aim of researchers employing the disconfirmatory method is to propose alternative hypotheses that seek to disprove the original hypothesis. For counselors this approach would mean finding out if another hypothesis might match the client responses better than their original hypothesis (e.g., if the hypothesis is that the client is introverted, then check to see if the client displays any extroverted behavior). The disconfirmatory approach has been touted as being logically superior (Mahoney, 1976; Platt, 1964; Weimer, 1979), yet was not often used by counselors in either Snyder's (1981) or Strohmer & Newman's (1983) research.

By incorporating a sequential and interactive format, this study was able to examine HTSs in more detail than previous researchers. This study was also able to address the accuracy of introversion and extroversion hypotheses by subjects using a particular HTS. The hypothesis here was that the confirmatory approach would be the least accurate and the disconfirmatory the most.

In addition, for Experiment II, undergraduate subjects were asked to respond to a computer simulated counselor that attempted to diagnose if the subject was extroverted or introverted. This computer counselor was randomly assigned to follow only one form of the above HTSs. The sub-

jects then rated this computer counselor using the Counselor Effectiveness Rating Scale (CERS) (Atkinson & Wampold, 1982). Within counseling, this need to understand the client's reactions to questioning strategies highlights how psychology often differs from many other scientific disciplines in that the object of research may interact with the experiment or the experimenter. As more information on client reactions to HTSs, on accuracies of different HTSs, and on prevalence of use of HTSs are gathered, the cognitive processes of counseling can be better understood and incorporated into training programs.

Use of Computers to Examine Interactive and Sequential Data

In order to study the interactive nature of the client-counselor dyad, a computer was chosen to first play the role of a client and then later, in Experiment II, a counselor. Since computers cannot respond in a completely human-like manner, their acceptance by clients might seem to be in jeopardy. Actually, empirical evidence does not find the computer to be impersonal or dehumanizing (Erdman, Greist, Klein, Jefferson, & Getto, 1981).

> Early concerns about the presumed impersonal nature of computer interviews have been refuted by the fact that most patients find the interviewing process enjoyable and the interview content relevant to their problems. In fact, several studies have suggested that as subject matter becomes more sensitive, respondents appreciate the non-human interviewer even more (Erdman et al., 1981, p. 394).

A major advantage to using a computer is that sequential data can easily be collected. For example, if a subject or counselor first asks a neutral question will s/he follow with a confirmatory question?

Method

Subjects

Students in the subject pool provided by the Department of Psychology (n=95) in conjunction with students responding to advertisements located on campus (n=52) comprised the sample of 147 subjects (53% male, 47% female; Mean age = 20; 73% Caucasian, 14% Asian American, 13% other). The students from the Psychology Department were required to complete experiments as part of their coursework. When it appeared as though a sufficient number of subjects were not being recruited by the Psychology subject pool, an advertisement offering two dollars to students if they completed the experiment was posted. Both groups of students completed the experiments in a microcomputer laboratory located on campus. The computer was formatted to randomly place each student into experimental groups. No student was eliminated due to characteristics such as gender or ethnicity. Both groups did not have significantly different X^2 distributions on gender and age variables and were overwhelmingly 1st or 2nd year college students. For the purposes of this study they were collapsed into one group.

In addition, 23 counselors-in-training from the Graduate Counseling Psychology Program voluntarily completed Experiment I (Mean age = 32, 13 Master degree students, 10 Ph.D. degree students, 7 male, 16 female). Although there were approximately 60 counseling students that potentially could have participated, the number of students that actually were available was closer to 40 (e.g., students in internship or practicum locations rarely came to the counseling psychology building). These data were analyzed separately from the other subjects as they were considerably older and had different backgrounds and training from the other subjects.

In addition, separating this data allowed for comparisons to other researchers' results and for a more conclusive discussion on counselor training.

Procedures

Experiment I. This experiment was similar to those of Snyder and Swann (1978) and Strohmer and Newman (1983). In Snyder and Swann's (1978) experiment, subjects were given a descriptor of an extroverted (or introverted) person. The subjects were then instructed to determine the extent to which a person that they were shortly to meet had behaviors and experiences that matched those of the descriptors they were given. This was to be accomplished by choosing 12 questions from a list of 26 that they would use to make their decision. A major difference between Snyder and Swann's (1978) and Strohmer and Newman's (1983) procedures is that Strohmer and Newman included neutral question possibilities whereas Snyder and Swann had subjects choose mainly among extroverted, introverted, and irrelevant question categories. Although in some experiments subjects actually went on to interview targets, the first experiment was over when the 12 questions were chosen.

Strohmer and Newman (1983) and sometimes Snyder (1981) followed their first experiment by having their subjects interview targets. The extrovert, introvert or neutral questions by subject were summed to determine what HTS was used. Unfortunately, they did not determine subjects' hypotheses while actually interviewing targets.

Three major modifications of Snyder and Swann's (1978) and Strohmer and Newman's (1983) procedures for the present study were: 1) the task for the subjects was sequential and therefore allowed for client feedback and assessed strategies beyond the first interview question, 2) a computer

was used to present the items and acted as a simulated client, and 3) descriptors were not given prior to beginning the experiment. Snyder (1981) had found that giving no descriptors was the one condition that lead to a more unbiased response by subjects. As in Snyder and Swann's (1978) experiment, subjects were told that they were part of an experiment to help determine how people come to know and understand other people.

After turning on the computer and answering the demographic questions, subjects were asked to select one of three randomly presented questions to ask the computer simulated person. After choosing one question, the computer simulated person's response was presented and again the subject chose from three possible questions.

Subjects were presented with 12 question sets. An example of what appeared on the computer monitor follows (the computer makes the following statement first):

> Hello, I understand that you have some things that you wish to ask me.
>
> (Choose from the questions below by typing 1, 2, or 3.)
>
> 1. Yes, I would first like to know if you enjoy talking with people.
>
> 2. Yes, I would first like to know if you enjoy talking with people or enjoy being quiet around people.
>
> 3. Yes, I would first like to know if you enjoy being quiet around people?
>
> Your choice? ___

If the subject choose "2" then the next screen might display the following response.

> I guess I like being quiet, but sometimes enjoy talking with people.

Actually, there were six different computer simulated responses to the three question choices above. This was because the subjects were randomly assigned to three computer simulated personalities, each personality having two possible responses. These personalities corresponded to an extroverted person, an introverted person, and a neutral person. The two response possibilities for each simulated personality were a confirmation, or a disconfirmation response with some elements of confirmation. The disconfirmation response included some elements of confirmation because research by Snyder (1981) shows that clients usually can find some incident of an asked-for behavior even if it is not their usual behavior. The response of the computer was therefore dependent upon the type of personality it portrayed and the choice of questioning strategy of the subject. Figure 1 helps demonstrate this branching network for an introverted simulated person.

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Insert Figure 1 about here

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The "Rating of Extroversion or Introversion" alluded to in Figure 1 is a rating scale that appeared on the monitor after each simulated person response. This rating is very crucial as it determines if the subsequent question choice is a confirming, neutral, or disconfirming HTS. For example, if a subject's hypothesis is that the simulated person is extroverted and they follow with an extroverted question, then they are following a confirmatory HTS. This rating scale was not included in either Snyder's (1981) research or in Strohmer and Newman's (1983) research. The rating scale appeared on the computer monitor as follows.

On the scale below where would you rate this person?

Highly Introverted						Highly Extroverted
1	2	3	4	5	6	7

Your choice is? ____

One final change from the experiment of Snyder and Swann (1978) was that there were two different sets of instructions to which subjects were randomly assigned. One set virtually repeated Snyder and Swann's (1978) instructions to find out if the person was extroverted or introverted (fact finding). The other set asked the subjects to consider the amicability of the question, i.e., the comfortableness of the question to the other person. This variable was included as counselors often need to consider both their need to gain facts from clients and the comfort of their clients. It was hypothesized that this might change the choice of HTSs with the fact finding instructions yielding more disconfirmatory strategies. The two sets of instructions as they appeared on the monitor follow.

Fact Finding Instructions:

> Your task in particular is to try to determine if the person you are interviewing is extroverted or introverted.

Comfort Instructions:

> Your task in particular is to try and determine if the person you are interviewing is extroverted or introverted AND in addition, to make this interview comfortable for that person.

The order of presentation of computer screens for the subject was as follows:

1. Explanation of the experiment.
2. Set of instructions (fact finding or comfortableness).
3. Presentation of three possible questions to ask simulated person.

4. Presentation of simulated person's response.

5. Rating of introversion or extroversion.

6. Repetition of 3-5 above until all questions were asked.

The computer recorded each choice and stored the results on a diskette. It also summed up the total number of confirmatory, neutral, or disconfirmatory statements so that a matching of mismatching analysis of client's preferred HTS with a simulated counselor's presentation of a HTS was possible in Experiment II that followed.

Experiment II. In Experiment II, the computer became the questioner and attempted to determine how introverted or extroverted the undergraduate subject was (the sample size was too low to analyze the counselor subjects). In this experiment, the computer took a 1) confirmatory approach, 2) disconfirmatory approach, or 3) neutral approach and then followed with questions concerning how the subject felt about the approach they received. In this way it was possible to determine if one HTS had a different effect upon subjects than another HTS. In addition, subjects were randomly matched and mismatched according to the HTS they used most frequently in Experiment I. Figure 2 presents the basic interview pattern which the computer used to ask questions in the confirmatory mode (13 in all).

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Insert Figure 2 about here

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Instruments

The questions used for all response sets in Experiment I and II were first rated by two graduate students in the Counseling Psychology Program into extroverted, introverted, or neutral orientation categories. These

question categories used adjectives that were described in Morris' book Extraversion and Introversion (1979) as typically describing extroversion or introversion. Morris (1979) used many of the factor studies of Eysenck to differentiate these adjectives. The rater's categorizations were then compared to the previously determined categories for these questions. Only five of the 240 questions were sorted in different categories representing an interrater reliability of .98. With minor alterations of word order and replacing the word "cool" with the phrase "kind of cold" the raters reached 100% classification agreement.

Following the completion of the interview in Experiment II, a set of experimental questions was presented to the subjects on the computer monitor. The primary set of questions was those from the Counselor Effectiveness Rating Scale (CERS) (Atkinson & Wampold, 1982). The CERS has 10 questions that subjects rate on a seven point scale (1 = bad, 7 = good). These questions are then collapsed into the three dimensions of Expertness, Attractiveness, and Trustworthiness, plus one question that was labeled counselor Utility. The internal consistency reliability coefficients (Cronbach's alpha) reported by Atkinson and Wampold (1982) across the dimensions of Expertness, Trustworthiness, and Attractiveness were .88, .75, and .78, respectively. The intercorrelations among the subscales ranged from .54 to .76.

In addition to the CERS, four more questions were included to find out how the subjects responded to completing an experiment on a computer and to evaluate their previous computer experience. These questions also were presented using a seven point Likert-type scale.

Results

Experiment I

Experiment I incorporated a check on the "fact finding" mission of the previous studies by Snyder (1981), and Strohmer and Newman (1983) by including instructions to approximately half of the undergraduates to take into account the "comfort" of the person they were interviewing (all counselors received the "fact finding" instructions due to their low sample size). There was no significant difference between the "comfort" and the "fact finding" instructions ($X^2(3, N=147)$, $p=.98$). The data were therefore collapsed across this dimension for the purposes of further analysis.

The distribution of undergraduate's choices for HTS was: Confirmatory = 28; Neutral = 73; and Disconfirmatory = 19. For the Counselors-in-Training this distribution was: Confirmatory = 3; Neutral = 16; Disconfirmatory = 1. Both distributions were significantly different from a random distribution ($X^2(2, N=120)=41.85$, $p < .001$ and $X^2(2, N=20)=19.9$, $p < .001$, respectively). The results strongly indicate that there is a preference for the neutral strategy (61% and 80%, respectively).

As a check on the equivalence of the comparison between Snyder and Swann's (1978) and Strohmer and Newman's (1983) experiments, the first HTS chosen by each undergraduate was also examined. Again, the neutral HTS was chosen more often (50.3%) followed by the confirmatory HTS (30%) and disconfirmatory (19.7%) ($X^2(2, N=147)=21.4$, $p < .001$).

For the sequential analysis, the 12 questions in Experiment I were divided into three sections. Section 1 used the second through the fourth questions, section 2 the sixth through the eighth, and section 3 the tenth through the twelfth. Question 1 was not used because no hypothesis was

available until after the subject received the computer simulated person's first reply and rated the degree of introversion or extroversion of that reply.

The three types of HTS used by all subjects in each section was summed and compared to a distribution where the amount of usage of a particular strategy was distributed equally among each section. As shown in Tables 1 and 2, there was no difference in the distributions among the sections.

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Insert Table 1 about here

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Insert Table 2 about here

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A lag of one analysis examined what HTS followed a confirmatory, a neutral, or a disconfirmatory HTS. The percentages of each HTS were first calculated to establish an expected distribution. These percentages for the undergraduates were: Confirmatory = 24.2%; Neutral = 41%; Disconfirmatory = 20%, and no HTS = 14.6%. The category "no HTS" results when the hypothesis of the subject is neither introverted or extroverted oriented (rating = 4). When this occurs, there is no way to decide if the subject is using a confirmatory, a disconfirmatory, or a neutral HTS. Table 3 indicates what HTS followed the three HTS categories and if this distribution is significantly different from the expected distribution.

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Insert Table 3 about here

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Table 3 shows that more often than expected a particular HTS followed itself. This indicates that a person will choose one particular HTS and then continue to use it across the interview.

To check if the preceding results were biased by strong stability within one HTS and not the others, the undergraduate subjects were divided into the categories of summed HTS (confirmatory, neutral, and disconfirmatory) and the same lag of one analysis was performed. This time within each of these categories there was no significant differences found from the expected distributions. This indicates that subjects within their preferred categories followed every HTS used with an HTS in the ratios of their preference (e.g., Subjects that had a summed HTS of neutral followed any HTS used with a 59% chance of using a neutral HTS. The distribution for neutral HTS subjects was 59% neutral, 15% confirmatory, 13% disconfirmatory, and 13% no HTS).

This again indicates that the only stable pattern found was that subjects tended to prefer one HTS equally across all sections of the interview and preferred to follow any particular HTS with their summed choice.

A final analysis performed on the undergraduate data from Experiment I was to examine which category of summed HTS was more accurate in predicting the introversion or extroversion of the computer simulated person. The neutral and disconfirmatory categories were very similar with 48% and 44% respectively, but the confirmatory category dropped to only 28% accuracy (random choosing would yield around 33% accuracy as there were three possibilities: introvert, extrovert, or neutral). Although

appearing significant, these results must be considered cautiously as they were not significant statistically ($X^2(2, N=120)=3.55$, $p < .25$).

Experiment II

In Experiment II the computer plays the role of counselor. The primary purpose of this experiment was to record the reactions of subjects to being interviewed by the three different HTSs. The dependent variables under consideration were the three summary variables from the CERS of Expertness, Trustworthiness, and Attractiveness. In addition to the independent variable of Computer HTS (the strategy the computer used on the subject), the level of the subject's Computer Experience, the subject's Gender, and the Match between the subject's own preferred HTS and that chosen by the computer were examined. Computer Experience was originally rated by subjects on a 1 to 7 Likert-type scale. For purposes of this examination, the ratings of 1 to 2 were considered as "high" computer experience, 3 to 5 as "middle," and 6 to 7 as "low." Table 4 reports the means and standard deviations of the CERS scales and the four additional scales (there were not enough counselor subjects to be analyzed in Experiment II).

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Insert Table 4 about here

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The MANOVA resulted in a significant difference for Computer Experience ($F(2,0, 56.5)=2.758$, $p=.013$), and in Computer HTS approaching significance ($F(2,0,56.5)= 2.009$, $p=.065$). Univariate F-test on these two dimensions showed Trustworthiness for Computer HTS ($F(2,117)=4.127$, $p=.019$), and Trustworthiness ($F(2,117= 4.080$, $p=.019$) and Attractiveness

($F(2,117)=6.339$, $p=.002$) for Computer Experience to be significant. Duncan's LSD multiple comparisons tests were then performed which indicated that subjects rated the simulated interviewer as being more trustworthy when using the neutral strategy than when using the confirmatory or the disconfirmatory strategy ($F(2)=3.94$, $p < .02$). In addition, the computer was judged more attractive by the students with moderate computer experience ($F(2)=6.38$, $p < .01$).

Discussion

Concerning hypothesis testing strategies, there are three implications that come from this study. First, the results of Strohmer and Newman (1983) that the neutral HTS is preferred by people in general and specifically by counselors is substantiated. This study also eliminated a possible confounding error of Snyder's (1981) and Strohmer and Newman's (1983) research, in that subjects were not conditioned to use any specific HTS. For their experiments when subjects had pre-selected confirmatory questions they used them, and when subjects had pre-selected neutral questions they used them. In addition, this study examined the sequential choice of HTS's and found that the neutral strategy was preferred across the whole interview. These findings, along with Strohmer and Newman's (1983), are contrary to the implications of human information processing research where the confirmatory HTS seems to be the strategy used on simple cognitive tasks (Nisbett & Ross, 1980; Salmon, 1975; Snyder, 1981; Wason & Johnson-Laird, 1972). This contradiction is an example of where research from the human information processing domain needs to be critically examined before being accepted for the complex interactional question pertaining to counseling research.

The second implication from this study is that a subject's choice of HTS is stable over time and regardless of feedback from targets. When analyzing which HTS followed another, it was found that undergraduates and counselors followed a particular HTS more often than chance with the same HTS. And again, when the 12 questions were broken into three sections, there was no shifting in strategies from section to section. These results were not what was expected, especially for the counselors. It was assumed that once the counselors had received some fairly strong evidence that their target was introverted or extroverted, that they might shift to a disconfirmatory strategy to check out their hypothesis. This was not done. Instead, counselors were about as stable in their choices as the undergraduates. This lack of shifting of HTSs may have influenced the predictive results with the neutral strategy yielding 48%, the disconfirmatory 45%, and the confirmatory only 28% correct predictions. Since the computer did not respond out of character, it would seem that the subjects would eventually approach 100% accuracy for at least the overtly introverted and extroverted simulated clients. The lower prediction for subjects that used the confirmatory HTS is quite interesting as it indicates that the previously mentioned "confirmationist dilemma" may be operating.

The third finding that the neutral HTS was rated as more trustworthy by the undergraduates is noteworthy. Since this was an analogue to a beginning session the obvious implication is that if building trust is a major goal of a counselor then the HTS of choice would be a neutral one. One limitation of this finding is that the neutral strategy was also most often used by this same group of subjects. It would not be difficult to understand that they saw a particular strategy more trusting when they themselves preferred it. A second limitation is that since these subjects

were not from a clinical population it may be difficult to generalize this finding to a clinical setting.

An intriguing question is why did counselors and undergraduates use a neutral strategy when the disconfirmatory strategy is considered to be logically superior for testing hypotheses? In cognitive research, subjects also used a confirmatory strategy when the disconfirmatory strategy is again logically superior. What is so disappealing about a disconfirmatory strategy? This study indicates that undergraduates rated a neutral strategy as more trustworthy. Perhaps counselors and people in general also sense that a neutral strategy will be received by targets as more trustworthy. Three other possibilities might be that most of the time people are not actually attempting to logically test their hypotheses, that people are not trained in how to test hypotheses, and that the disconfirmatory approach specifically is seen as more challenging and confronting and thereby less friendly. These would possibly answer why the accuracy of predictions was not high. Even though subjects had their attention drawn to the hypotheses of extroversion or introversion, they might not have known how to logically answer the question or might not have wanted to appear confrontative to their targets.

Although conclusive research results have not been gathered to indicate what HTS's are used throughout many sessions or what client responses might be under differing conditions, it is important that counselors become aware of their potential processing biases. What is often desirable is that a counselor has an informed choice of where s/he is going with a client. The stability of HTS choice regardless of feedback indicates that counselors may not realize their own biases and therefore may not have access to alternative HTSs. Lack of using a disconfirmatory strategy

for counselors is a serious issue as accuracy of hypotheses is important. This would indicate that training counselors to recognize their own styles and to be aware of when to modify their HTS choice is necessary. It would seem especially important if a counselor's HTS preference is a confirmatory one.

In order to introduce cognitive processing training, counselor training programs could include a section in their skills classes that covers relevant research. Computer programs, similar to the one written for this study, could help point out the types of strategies that counselors are using in different settings and across sequential questioning. For example, Hummel, Lichtenberg, and Shaffer (1975) have already written and conducted research on a computer training program called Client 1. Counselors could practice different HTSs with each other or with simulated clients. In addition, since the computer can keep records of how often or when a counselor changes their HTS, supervisors could use this information to help supervisees understand their progress in counselor training classes or practicums.

Although this study furthered the investigation of HTSs by including a sequential format, there are many more questions yet to be answered. Additional research might address whether (1) HTSs change from session to session or change during longer periods than the 12 questions of this study, (2) differing conditions yield different HTS (i.e., conditions other than determining extroversion and introversion), (3) different clients change the individual's choice of HTSs or change the choice by counselors in general, (4) training in HTSs changes the actual usage of HTS, (5) a computer simulated client can accurately address the above questions, and (6) whether counseling outcomes can be beneficially changed by HTS training.

Use of Computers to Investigate Cognitive Processes in Counseling

One of the basic questions that this study considered was the viability of using a computer in researching the cognitive processes of counselors and clients. Martin (1984) has proposed that there are only three methods to assess the cognitions of counselors; process tracing, simulated recall, and cognitive training. Process tracing is a method that is difficult to do during an actual counseling session, simulated recall requires retrospection, and cognitive training involves manipulating the counselor through training (Martin, 1984).

A fourth method, not mentioned by Martin (1984), employs the computer as either the client or the counselor. The main advantages of using a computer are that 1) its cognitions and behaviors (responses printed on the monitor) are known, 2) it does not mind if the session is interrupted, 3) it can analyze the session independently of its role as a client or counselor, and 4) it can record unerringly the subject's behaviors, asked for cognitions, and any other relevant data. The two possible limitations are the fact that it may not appear real to the client or the counselor and interruptions to record the participant's reactions might interfere with their normal cognitive processes.

In regards to the first limitation, most studies that have compared the use of computers to humans have shown that computers actually fair better than humans in being accepted by participants. For example, computers are seen as more expert and trusting than humans (Angle, 1981; Erdman, et al., 1981). The results of this study also support this conclusion in that the CERS ratings were equal or higher than the representative scores reported by Atkinson and Wampold (1982). The finding that subjects with moderate computer experience found the computer counselor even more

attractive is interesting. Perhaps beginning computer users were more phobic of the computer and this sentiment passed on to the computer counselor. Advanced computer users might have known too much about how computers work which depersonalized the computer counselor. Further research into this variable seems warranted especially if psychologists wish to use computer programs as adjuncts to testing and therapy.

As to the second limitation of interference, it would seem that the computer presents a fairly unobtrusive method. The cognitive training mentioned by Martin (1984) which involves signaling though cues to others would present the counselor with the dilemma of losing his/her thought while counseling a real person. This might greatly inhibit the process of counseling and/or signaling. With the computer the counselor or client need not worry about the computer being bothered by the delay or the thought diversion. The participant can indicate their thoughts and then return to the issues before them.

A limitation not yet mentioned as it is not exactly a methodological limitation is the extreme complexity of computer programming which might limit the number of researchers who decide to use the computer for research. This limitation might actually be the one that retards the usage of this research tool, even though the computer does present the cognitive researcher with some powerful methods to understand the counseling process.

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Table 1

Undergraduates' HTS by Sections

Summed HTS	Count	Expected
Confirmatory[a]		
Section 1	102	100
Section 2	87	100
Section 3	111	100
Neutral[b]		
Section 1	195	191
Section 2	198	191
Section 3	179	191
Disconfirmatory[c]		
Section 1	76	85.7
Section 2	92	85.7
Section 3	89	85.7

[a] $X^2(2) = 2.94$, $p > .23$

[b] $X^2(2) = 1.09$, $p > .57$

[c] $X^2(2) = 1.69$, $p > .4$

Table 2

Counselors-in-Training's HTS by Sections

Summed HTS	Count	Expected
Confirmatory[a]		
Section 1	16	15
Section 2	13	15
Section 3	16	15
Neutral[b]		
Section 1	32	37
Section 2	39	37
Section 3	41	37
Disconfirmatory[c]		
Section 1	10	7
Section 2	7	7
Section 3	4	7

[a] $X^2(2) = .4$, $p > .8$

[b] $X^2(2) = 1.2$, $p > .55$

[c] $X^2(2) = 2.57$, $p > .27$

Table 3

Log of One Analysis for Undergraduates and Counselors-in-Training Across All Three HTSs

HTS Category	Conf	Neut	Disc	no-HTS	Chi-sq.	d.f.	p
Undergraduates							
Conf. count	132	100	92	29	54.3	3	.001
Expected	86	145	71	51			
Neut. count	115	312	86	101	35.2	3	.001
Expected	150	252	123	89			
Disc. count	65	113	78	33	9.5	3	.023
Expected	71	118	58	42			
Counselors-in-Training							
Conf. count	18	23	9	5	6.2	3	.102
Expected	12.8	28.5	5.7	8			
Neut. count	15	75	9	16	9.9	3	.019
Expected	26.8	59.6	11.8	17			
Disc. count	10	11	1	3	4.48[a]	3	.214
Expected	5.8	13	2.6	3.7			

Note: Conf. = Confirmatory HTS
Neut. = Neutral HTS
Disc. = Disconfirmatory HTS

[a]Due to cell sizes less than 5, this may be in error

Table 4

Means and Standard Deviations for the CERS and the Four Additional Scales for Undergraduates

Scales	Mean	SD
CERS[a]		
Expertness	15.36	2.98
Trustworthiness	14.82	3.37
Attractiveness	15.22	3.41
Additional Scales[b]		
Realistic	3.980	.164
Enjoyable	4.898	.142
Honest Response	6.701	.051
Computer Experience	3.803	.163

[a]Range of sumed scores are 3 = bad or low; 12 = neutral; 21 = good or high.

[b]Range of scores are 1 = bad or low; 4 = neutral; 7 = good or high.

Figure Caption

Figure 1. Responses for an introverted simulated person.

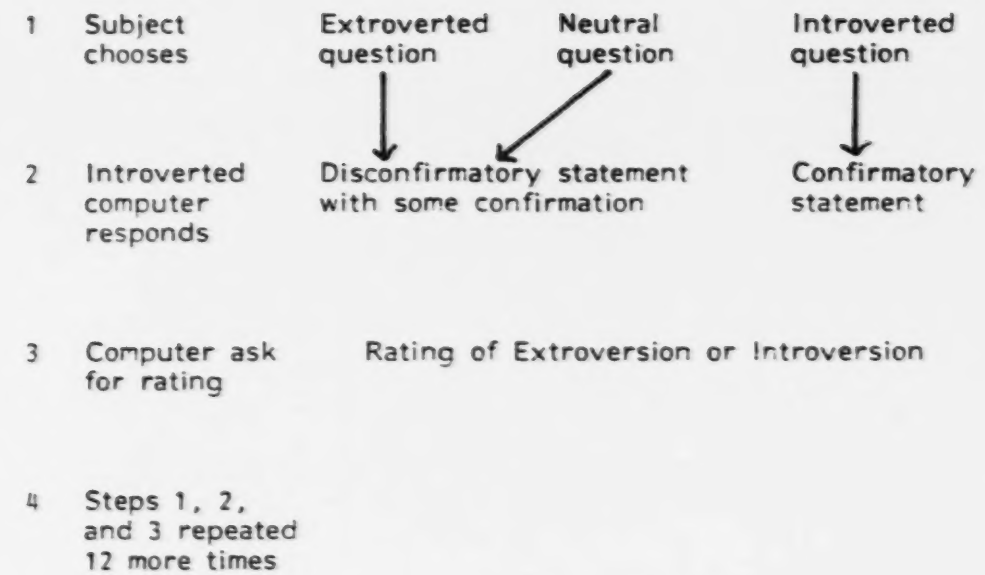
STEP
1
Subject chooses
Extroverted question
Neutral question
Introverted question
2
Introverted computer responds
Disconfirmatory statement with some confirmation
Confirmatory statement
3
Computer ask for rating
Rating of Extroversion or Introversion
4
Steps 1, 2, and 3 repeated 12 more times

Figure Caption

Figure 2. Interview pattern for computer counselor with a confirming HTS.

STEP				
1	Computer Questions		1st question	
2	Possible client response is	extroverted	neutral	introverted
		↓		
3	Computer response question is	confirming extroversion	confirming neutral	confirming introversion
4	Possible client response is	extroverted	neutral	introverted
				↓
5	Computer response question is	confirming extroversion	confirming neutral	confirming introversion
6	Steps 4 and 5 repeated 10 more times			